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September 16, 2004

Mr. Gerard J. Thibeault, Executive Officer
California Regional Water Quality Control Board
Santa Ana Region
3737 Main Street, Suite 500
Riverside, CA 92501-3339

Subject: Tentative Resolution No. R8-2004-0037: Proposed Basin Plan Amendment – Incorporation of Total Maximum Daily Loads for Nutrients for Lake Elsinore and Canyon Lake.

Dear Mr. Thibeault:

Thank you for the opportunity to review and comment on Tentative Resolution No. R8-2004-0037: Proposed Basin Plan Amendment – Incorporation of Total Maximum Daily Loads for Nutrients for Lake Elsinore and Canyon Lake. As the second review of this document, it should be noted that several of our concerns were not satisfactorily addressed in this revision and these comments are included for your reconsideration. Our comments are as follows:

As a general comment, the revised TMDL sets a numeric target limit for both phosphorus and nitrogen. These numeric target levels are for the lake and as there is no assimilative capacity in the lake, it is our understanding that these target levels will be included in the discharge permits. The cost associated with meeting these numeric target levels are significant. Although, it's stated that they are numeric targets, in reality it's planned on being used as a water quality objective. Water Code Section 13241 provides that the Regional Board shall consider economics, as one of the factor in the establishing water quality objectives. EMWD believes it is necessary when a numeric target is used as water quality objective that an economic analysis be performed before imposing such a standard on a discharger. Your response to comments states that "Data deficiencies are explicitly acknowledged and reflected in the proposed compliance schedules and implementation plan requirements for monitoring (including the collection of wet-weather data), model updates and periodic review of the TMDLS to consider appropriate refinements." The dischargers will be held to the numeric targets as permit limitations while the TMDL will adjust when the

data deficiencies are accomplished. It would make sense that the discharger not be held to the numeric target until these data deficiencies have been met for the numeric targets have the potential to change based on this analysis. It is EMWD's position that there still is not enough information to move forward with interim and final load and waste load allocations for the Lake Elsinore TMDL and use of the numeric target as a water quality objective. Given that the first interim target is not effective until 2015, there would appear to be ample time to gather additional information such as the effects of wet weather events, recycled water additions to the lake and in-lake treatment systems such as lake mixing and aeration projects. The additional data gathered would provide a sounder basis for the development of the target allocations.

At the workshop, the option to mitigate or pollutant trade has been raised as an option available for the dischargers in the watershed. In concept this seems like a viable option, but again, this is an area that has not been used in California and is essentially new territory for your office and the watershed. It seems that no one can meet the numeric targets and as such, all will be looking into mitigation and pollutant trading. Although not confirmed through analysis, EMWD is concerned that the available mitigation projects will not meet watershed demands necessary to reach the numeric targets. We recommend that time be provided to evaluate the viability of pollutant trading and offset mitigation.

Additionally, EMWD would support the continuation of the pilot project for use of supplemental water during the dry weather to ensure and stabilize the lake level. As currently proposed without the pilot project, adoption of the TMDL would effectively prevent EMWD from contributing any recycled water to Lake Elsinore. EMWD's discharge permit to Lake Elsinore would include permit limitations for nutrients that EMWD cannot meet without significant treatment costs. There is evidence from the UCR study conducted by Dr. Anderson that recycled water addition's benefit the lake. While there is a statement that prolonged and increased external loading will exacerbate long-term internal loading, there is also recognition that stabilizing the lake level is of greater short-term importance than nutrient loading. The report states that "The poorest water quality observed in the lake was more closely associated with the declining lake level than recycled water inputs or high lake nutrient concentrations."

The response to comments dismissed our cost estimate for upgrading the Temecula Valley Regional Water Reclamation Facility (TVRWRF) to meet the nutrient criteria of 1.0 mg/L and 0.1 mg/l for nitrogen and phosphorus, respectively. These costs were taken from a report developed for EMWD by Carollo Engineers entitled "Live Stream Discharge Alternatives, TVRWRF, EMWD." The cost of \$37M is the present value cost for capital (\$24M) and operations (\$13M) to meet the specified nutrient criteria for 8 MGD. The treatment process includes both chemical and biological nutrient removal; the report further states that these processes cannot guarantee the effluent quality. Additionally, the TVRWRF is being expanded to 18 MGD and the \$37M is for only 8MGD, therefore the cost


to remove nutrients will increase proportionally as the plant expands. As clarification, the costs used in the staff report for EMWD upgrades were based on the CH2MHill report developed by LESJWA, and stated that these costs were more accurate than the costs EMWD presented at the Board meeting. The cost estimates in the LESJWA report were for phosphorus removal only, excluding nitrogen removal. Using the LESJWA cost estimates does not capture the magnitude of costs associated with meeting the proposed numeric targets.

Listed below are specific comments on the Resolution No. R8-2004-0037:

- Page 4: The phosphorus and nitrogen numeric targets listed in Table 5-9n are set at levels that cannot be attained without significant treatment costs and it is requested that an economic analysis be included in the TMDL.
- Page 7: It is our understanding that the waste load allocation for supplemental water is based on total phosphorus of 0.2 mg/l, however, Table 5-9r for the final total phosphorus appears to set at 0.1mg/l.
- Page 8 D – The last paragraph states that, “Compliance with numeric targets will ensure water quality improvements that prevent excessive algae blooms and fish kills, particularly during the critical summer period when these problems are most likely to occur.” This is a broad statement that does not take into account the cost of achieving the numeric targets and other lake dynamics, such as, low lake level that may impact the aesthetics of the lake.
- Tasks 3.1, 3.2, 8, 10, and 11 – EMWD is listed as a responsible party for the studies associated with these tasks. Due to the significant costs associated with the meeting numeric targets, it may not be feasible for EMWD to provide supplemental water to the lake. If EMWD cannot participate, then EWMD should not be listed as a responsible party.

Thank you for the opportunity to participate in the TMDL process. Should you have any questions, please contact Jayne Joy at (951) 928-3777 ext. 6241 or David Morycz at ext. 6325.

Sincerely,



Anthony J. Pack
General Manager



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October 13, 2004

Regional Water Quality Control Board
3737 Main Street, Suite 500
Riverside, CA 92501-3339
Attention: Cindy Li

SUBJECT: Comments on Canyon Lake and Lake Elsinore Nutrient TMDLs

Dear Ms. Li:

The Elsinore Valley Municipal Water District (EVMWD) appreciates the work of the Regional Water Quality Control Board, its staff, and consultants on the Proposed Lake Elsinore and Canyon Lake TMDLs. The work has been a major effort, but appears to remain controversial because of the unique nature of the lakes. It may be that because the lakes are so far down the health scale that there is an instinct to revive them to good health with the tools at hand, namely TMDL's. Since Lake Elsinore is a naturally eutrophic lake, this may not be possible. All the studies to date include assumptions which when applied to water quality present insurmountable implementation problems because of costs and the unpredictability of nature. Setting standards that are costly and may be impossible to meet must include even greater State participation. The State needs to provide proof and certainty of the result of the requirements which if not achieved could become punitive to the same dischargers and stakeholders working with the RWQCB on this TMDL process. The staff "Response to Comments" for the September 17, 2004 workshop provide good dialog but require further discussion. In the spirit of furthering that dialog, EVMWD offers the following comments:

GENERAL

The TMDL proposal has some excellent points and attempts to solve a difficult situation in morphometrically eutrophic Lake Elsinore. However, several factors about the current lake are unique and artificial causing the management for maximum public benefit to conflict with some recommendations made in the TMDL. The TMDL could be improved in several ways. These primarily include a more realistic appraisal of the lake's potential for beneficial uses, recognition of the overriding need for a stable water level and reduction in fish kills and malodor.

The TMDL process is designed to restore polluted lakes to their original state by reducing nutrient inputs to levels that restore historical water quality, or at least some level above historical that is tolerable. The TMDL

recognizes that the TMDL process has difficulty in trying to reverse eutrophication in Lake Elsinore since it is a *naturally eutrophic* shallow lake with a large watershed. Unlike most lakes, the role of nutrients (and thus TMDLs) in Lake Elsinore are subordinate to lake level or the climate. Because of nutrient minimal impact, it is unlikely that the TMDLs as proposed will bring any noticeable change in beneficial use. However, the lake may be improved, not by just the traditional methods of imposing more restrictive TMDL values. The LESJWA Biomanipulation Plan that is dependent on a series of mechanical capital facilities is a nontraditional approach by providing appropriate lake ecology and managing and balancing the lake food web to control dominate species such as algae and carp.

The N, P, and chlorophyll *a* standards are unrealistically low for a lake with such a high ratio of watershed to lake surface area, especially since the lake has been artificially reduced in size by 50%. These three targets are not helpful. The targets are not reflective of the historic eutrophic nature of the Lake. LESJWA is currently studying lake sediment 10 meter deep core samples which have been dated to be between 8,000 and 11,000 years old. Nutrient studies of this core material are currently underway which could reveal the "natural" past of Lake Elsinore and should affect TMDL limits.

The current numerical TMDL targets for Lake Elsinore do not provide acceptable water clarity or protection from fish kills or malodor. More stringent TMDL targets are simply not attainable. The proposed targets for DO throughout the water column seems to be all that is required to protect beneficial uses at present. The UCR lake model indicates that an increase of water level will do more than any watershed TMDLs and conversely, a reduction in water levels will overwhelm any TMDLs. If numerical targets are set for N, the use of the TN as a numerical target should be avoided since TN in Lake Elsinore is dominated by biologically inert organic-N. The use of biologically available TIN (Total Inorganic Nitrogen = ammonia + nitrate) is suggested to replace TN. The use of TIN would change the T:P ratios and potential BMPs in the watershed. This TIN change should also be made in the Basin Plan.

The issue of a stable and high lake level, which exceeds water quality in importance, is not addressed adequately. The only discussion of lake levels in sections 2.1, 3.1 and 6 relate to the wide variation of levels, the lake drying out, that fish kills are related to low lake levels and that lake levels are used in the nutrient modeling of the lake. There does not seem to be any discussion of the effects of lake level on the overall health or chemistry of the lake and the relationship to setting TMDL's. Admittedly, lake level versus water quality has not been a part of most TMDL considerations, but Lake Elsinore is unique in this respect. However, the existing beneficial uses can be achieved by other methods, primarily by lake management and biomanipulation. The potential methods were given in the 2002 EVMWD NPDES permit application. Most importantly, good water clarity (> 2 m Secchi depth) is only achievable with biomanipulation that requires a relatively stable water level. The TMDL document will provide only ~ 0.5 to 1 m Secchi depth even if the TMDL targets are reached. A Secchi depth of 0.5 to 1 m is not an acceptable value for public water contact recreation. Finally, the controversial lake level

versus fish kill relationship (or lack of same) should be addressed in a more balanced way.

Environmental Checklist

In section VIII b) under Hydrology and Water Quality “no impact” is listed as to the effect on lowering or depleting groundwater supplies. EVMWD is in the process of adopting a Groundwater Management Plan in compliance with AB 3030. The final draft shows that without adoption of carefully managed basin with proposed implementation of conjunctive use, cumulative overdraft of the basin is expected. If use of the Island wells as part of the source of water for the lake is a mitigation requirement, the impact could contribute to overdraft of the groundwater basin. Review of the Final Draft Elsinore Groundwater Basin Management Plan should be done prior to adoption of the TMDL (CD enclosed).

Nutrient Load Model

The model is used to determine the nutrient loads allowable within the Lake and allocated to various sources. As these models have been established with more normal flow through lakes, caution must be taken and explained when being applied to shallow terminal eutrophic lakes. The Total Phosphorus (TP) limit has been conservatively set at 0.10 mg/l which is the 25th-ile for a period of data. The 25th-ile is used to provide a Margin of Safety (MOS) to prevent the load allocations providing too much pollution. If a 50th-ile is used the MOS is still sizeable at 100% as half of the data points are safely below the estimated standard instead of 3X as many data points being above as below for the 25th-ile. On the nomographs provided in figure 6-1 and 6-2 using 0.12 mg/l instead of 0.10 mg/l, the TP load capacity would increase by 10,000 kg/yr which is very significant when compared to the 2015 TMDL of 28,584 kg/yr. We believe a closer look at the MOS assumptions, especially for the interim 2015 WLA would be beneficial and could be the subject of further refinement as the future studies are completed before 2015.

There may need to be another look at selecting 1994 as the moderate year for modeling. It may make sense from a hydraulic point of view, but from a nutrient loading perspective it is anomalous in that it follows one of the highest flood years on record. Watershed conditions may not be similar to in-lake conditions that have been altered by cumulative effects of irregular prior years.

RECOMMENDATION SUMMARY (in order of priority)

1. A target water elevation of 1240 - 1246 ft. should be set as a long-term numerical TMDL target. This corresponds to a limnologically more meaningful 20 - 26 ft water depth.
2. Biomanipulation and in-lake TMDL management targets (methods) should be set in place of numerical N, P, chlorophyll, or Secchi targets (concentrations) at least in the short-term. This would allow time to evaluate the results of LESJWA's adaptive management approaches.

3. No target for in-lake nutrients (nitrogen and phosphorus) should be set with the exception of the Health Department rule of less than 10 mg/L as N for Canyon Lake (for drinking water source protection).
4. Nitrogen be defined as biologically available Total Inorganic Nitrogen (TIN) not Total Nitrogen (TIN + biologically unavailable organic-N) in-lake targets and lake models.
5. Phosphorus should be defined as either 80% Total Phosphorus (TP) or biologically available TP (most forms of P except apatite, calcium phosphate).
6. The lake level versus fish kill section should be reconsidered in the light of the lake model now available and with consideration of other options.

DISCUSSION OF THE PROPOSED TMDLS

The problems of Lake Elsinore include both conventional and rather unique elements. The lake itself functions uniquely, since for most years it functions as a sump for the watershed. Yet, sporadically, it functions as a flow-through water body. The lake has not been well studied over many years in the way that many other lakes have been examined. Thus, the TMDL has to extrapolate in some areas and make suggestions based on little data in others. These limitations are admitted in the TMDL. Although the extrapolations are often correct, in some areas they are questionable. This review discussed some of the questionable extrapolations and suggests alternatives.

Recommendation 1. Establish water elevation (minimum water depth) and small variation in water depth as prime targets for the TMDLs.

It has not been customary for TMDLs to consider water depth as a prime numerical target. This is because most lakes have a small variation in depth over the season and over decades. Lake Elsinore is an outlier in this respect and naturally dried out every generation or so. The TMDL shows that in-lake nutrient concentrations vary dramatically as the lake level rises and falls with the natural drought cycles of the semi-arid southwest USA. Even with almost no inflow (ideal zero daily loads), the water quality falls. Thus, the traditional TMDLs in the watershed play a small role in the beneficial uses of the lake.

The Lake Elsinore Recycled Water Project Draft Final Report (Anderson, August 2004) suggests that "...stabilizing the lake level may be of greater short-term concern than increasing nutrient concentrations." The Fisheries Management Plan for Lake Elsinore (EIP Associates, 2004) states that "...the success of the (fishery management plan) relies in part on the success of other enhancement measures...for example, lake stabilization."

The TMDL report should consider the reality of the role of water level in the lake. While no one wants large amounts of nutrients to be delivered to Lake Elsinore, there is no good way to provide beneficial use attainment without a higher and stable water level. Conventional TMDLs are simply not appropriate at this stage. When the lake water level is stabilized at an agreed upon a "desirable depth" of say, 20-25 ft (1240-1246 ft msl) the

water quality will probably improve so that the current TMDL targets will either be met naturally or can be established in a more meaningful context. The 1240-1246 ft. level is more consistent with the existing Agreement between the City of Lake Elsinore and EVMWD to control the lake level.

The long-term TMDL targets should be focused on reaching the desirable water level and maintaining as small as possible seasonal water elevation variations. Once this occurs, biomanipulation may occur with or without any help from TMDLs and lake clarity will improve, algae levels decline and the in-lake TMDL targets may be reached or exceeded. Without a stable water level, the TMDL targets will probably never be reached in a consistent fashion. The current numerical targets for Lake Elsinore do not provide any acceptable water clarity or protection from fish kills or malodor.

Variable lake level should trigger change of beneficial use designation in Basin Plan.

With the lake drying out historically, the beneficial use designations of WARM, REC1 and REC2 may be overstated because of their intermittent opportunity. This is not to say that the lake can't be used for fishing and water sports, but the circumstances for that use are usually less than optimal. For example, water clarity recently has been poor at less than 1 meter and game fish variety is small. The long term difficulties of sustaining adequate water levels without the use of recycled water is clearly demonstrated in figure 2-2. The problems of sustaining anything but nuisance fish is clear as described in the LESJWA proposed Fisheries Management Plan.

Summary of importance of stable water level.

With a stable sustained water level, the lake may be able to adapt to a lesser degree of eutrophication without the imposition of extremely conservative low water quality requirements. Without a stable water level, the lake will not improve. In the 2-½ year study of the effects of using recycled water to supplement the lake, it was observed that adding "distilled water" would not make a noticeable lake improvement because of the strength of the natural conditions. Without the recycled water from the pilot program, the current level of the lake would be 3.2 ft lower.

NUMERIC TARGETS: ALTERNATE SUGGESTIONS TO THE AMOUNTS AND DEFINITIONS USED IN THE TMDL

Dissolved oxygen.

The DO targets for the deeper water in Lake Elsinore and Canyon Lake (table 401 in the draft report) is satisfactory to achieve beneficial uses for two reasons.

- Research in Lake Elsinore has shown that high levels of DO (5-10 mg/L) are needed to fully suppress the release of soluble phosphate and ammonia (Beutel, 2000). This work confirms existing practices in proposed lake management.

- The most important beneficial use impairment in Lake Elsinore is lack of water. The final review of the Pilot program needs to be taken into account for using recycled water as a supplement to Lake Elsinore. The Draft final report admits that due to the changes in Lake Elsinore difficulties were created "trying to tease out the direct influence of recycled additions over the last two years". This source of water should not be precluded by restrictive discharge requirements until the impacts are fully understood. Nutrient removal to extremely low levels would be premature at best to further study the progress of other LESJWA projects to manage the Lake.

Recommendation 2. Numeric targets for nitrogen and phosphorus.

We understand that the RWQCB staff disagree, but reiterate our proposal for the record. The proposed targets in the TMDL for phosphorus are 0.1 mg/L and .05 mg/L both measured at total phosphorus (TP). The equivalent standards for nitrogen at 0.75 mg/L measured as total nitrogen (TN). The TP target is predicated on a supposed phosphorus limitation for algae growth in the lake and the TP standard is based on a 15:1 ratio of N:P.

The use of TN and not TIN to derive a P:N ratio inevitably biases the ratio to show phosphorus limitation. A more rational ratio of TIN: 80% TP should be used to determine if there is a relative shortage of P or N. Such a difference is not academic. The reduction of N or P from the watershed requires very different emphasis and technologies. Reduction of N, or P, in the lake may also require different methods. In addition, the reduction of N and P is best done in parallel with TIN and TP being kept at a constant 15:1 ratio. Use of TN to TP will obscure the balance in the desired ratio and provoke increased growths of possibly toxic blue-green algae cyanobacteria which could interfere with the proposed Biomanipulation Proposal.

New Consideration: Algal growth in Lake Elsinore is limited by light and CO₂, not nitrogen or phosphorus as stated in the TMDL.

Light limitation.

At present, it is unlikely that the lake is limited by any "conventional" nutrient such as nitrogen or phosphorus. TMDL targets based on N or P concentrations are one step away from reality. Light is probably the most limiting factor for most of the day and carbon dioxide limits growth in the afternoon when pH rises due to depletion of CO₂. The recent summer chlorophyll *a* concentration of > 300 mg/m² (>300 ug/L (2000-02, see TMDL appendices) exceeds the theoretical aerial maximum chlorophyll *a* value of 250 mg/m² even if the lake was only 3 ft deep. The high chlorophyll in the upper water uses up all the biologically usable light and thus the deeper algae are effectively in the dark and cannot photosynthesize. When the wind blows, surface algae are mixed down and deeper ones mixed up so, unlike flowers shaded by trees, they do not die. However, overall

growth, productivity, and potential oxygen demand in the sediments and in the water at night are still limited by available light, not nutrients.

With the current average depth of about 12 feet (3.5 m), there is far more algal pigment than can be efficiently used. The current value is approximately $1,000 \text{ mg/m}^2$ or four times the theoretical maximum. Even if the chlorophyll falls to levels found earlier at higher water levels (100-150 ug/L) the same high aerial value will occur since the lower pigment will be spread over a deeper water column. At these higher water levels ($\sim 25 \text{ ft}$, or 7.5 m) the lower chlorophyll per volume still integrates into over 900 mg/m^2 , almost identical to the current aerial values at lower water levels. At some deeper depth the mixing of deeper water will be small (see Anderson's Appendix in the TMDL) and chlorophyll values will fall in deep water so that the integrated column number falls. However, the decline will still put the aerial value well above the maximum and thus light will still limit algae growth in Lake Elsinore over all contemplated water depths.

Carbon dioxide limitation.

At or even much below chlorophyll *a* levels of 100-300 ug/L ($900 - 1,000 \text{ mg/m}^2$) the amount of dissolved carbon dioxide is not able to keep pace with maximum photosynthesis. Carbon dioxide will dissolve back into the lake each night so that the next morning algal growth can resume but this still means the daily production rate is limited by light and carbon dioxide.

Given the rate of internal loading of both N and P and current concentrations of the soluble bioavailable forms of these two elements, it is doubtful if the target concentrations can be reached, or if reached will attain the decline in algae required to meet beneficial uses. For most lakes, a minimum water transparency of 2 m ($\sim 6.5 \text{ ft}$) measured as Secchi disc depth is required to establish body contact as a beneficial use. At this water clarity, lifeguards and other swimmers could see the body of a drowning swimmer in much of the shoreline water. The current predictions of water transparency are in the range of 0.4 to 1 m (1.3 to 3.3 ft). The beneficial use improvement of water clarity increases of 1 to 3 ft are not an obvious beneficial value increase for a lake with many public beaches and good use potential.

Recommendation 3.

Based on the above discussion it is recommended that the current policy with no fixed standards for the lake, in terms of phosphorus and nitrogen, be continued. Tightening the dissolved oxygen standard (see below) will provide a better protection of beneficial uses than the indirect N or P standards. We understand the need to set numerical standards to meet The EPA guidelines and understand the implication of EPA_rejection or possible litigation, but setting numeric standards for the sake of the numbers is not in the best interest of the lake or the public that may benefit from the lake even in its unique eutrophic ephemeral state. The EPA guidelines must surely have some provision to manage water quality that is not the typical numerical standard requirements.

Increased dissolved oxygen standard.

A standard for DO throughout the water column seems to be all that is required to protect beneficial uses at present. The climate seems to make a mockery of attempts to control the lake nutrient values. However, an increase in imported water to maintain the lake at a much higher level, regardless of the water source or nutrient levels (within reason) seems the optimum way to improved lake beneficial uses. It is noted that the water quality model developed by Professor Anderson shows a continual improvement in water quality as the lake depth increases (see Appendix B of the TMDL).

It is likely that fish kills in Lake Elsinore are due to low DO, in particular short nocturnal episodes in calm conditions followed by mixing. The force for mixing could be either wind, or convection currents. Oxygen runs out in bottom waters when mixing of oxygen-rich water ceases or is slowed so that the demand for oxygen in the sediments exceeds the supply provided by vertical mixing. For almost any inflow of nutrients into this particular lake, there will be a high sediment oxygen demand (SOD). Warm water fish in Lake Elsinore can escape low bottom water DO by moving to the surface. However, when the lake turns over with little bottom DO, the entire water column can fall below 1.5 mg/L DO and large fish kills occur within minutes.

ADJUSTING THE DEFINITION OF N AND P TO REFLECT THEIR USE BY NUISANCE ALGAE

Recommendation 4. Nitrogen definition.

While staff has stated its disagreement with the definition of the best nitrogen criteria and deferred the nitrogen standard to the 2020 TMDL, it is critical that the true nitrogen requirements be studied as part of the RWQCB's commitment to make adjustments to the TMDL as part of the triennial Basin Plan reviews.

The use of TN is not appropriate for lake water quality targets or models and will blur any efforts to determine cause and effects. Total-N includes the two main bioavailable forms of nitrogen (nitrate and ammonia + total inorganic nitrogen or TIN), but, also, the biologically unavailable form of dissolved and particulate N. For algae control, it is the TIN that is important. The current approach uses TIN and its continuation is recommended. If TN is used instead of TIN, the target will be meaningless since it is quite possible that the standard could be met, but algae blooms would continue and vice versa. In Lake Elsinore the difference between TIN and TN is critical, since most of the TN is organic nitrogen and very little is bioavailable TIN (draft report, Chapter 4, Table 4-2). If TIN were used instead of TN it is probable that the lake would become strongly N-limited as is typical of eutrophic. For example, constructed wetlands in the watershed are an excellent and inexpensive way to reduce nitrate (e.g. Santa Ana River or San Diego Creek) while it is much more difficult to reduce phosphate or TP with such wetlands (e.g. Florida Everglades protection wetlands project). Conversely, it is

relatively easy to reduce TP loading with detention ponds in the watershed but hard to remove nitrate with such devices.

The use of TN for recycled water is problematic in normal treatment processes for nutrient removal. In a recent report on upgrading the EVMWD Regional TP (provided to Ms. Hope Smythe) for nitrogen and phosphorus removal it is pointed out that effluent TIN is expected to less than TN by 1.5-2.0 mg/l. Normal nutrient removal for nitrogen reaches 2-2.5 mg/l TIN. The long term TMDL of 0.75 mg/l TN will require external offsets which seems excessive when put in relation to the tremendous positive value of water supply for the Lake. The supplemental water WLA should be set based on the available treatment technology being proposed as part of the LESJWA projects.

Recommendation 5. Phosphorus definition.

While staff disagrees, we believe that further study is required to validate the best phosphorus standard, if needed. In contrast TP is a usable standard so long as the TP does not contain much unavailable P (usually apatite, calcium phosphate). The target should be amended to target biologically available TP. The internal loading from the sediments is always soluble and biologically available phosphate and is thus covered by the TP designation. However, external loading may be mostly apatite washed in from erosion of the surrounding hills and creek banks. Tests are needed over several storms to assess the percentage of inflowing TP that is biologically available.

Difficulty of setting TMDL targets in Lake Elsinore.

The levels of nutrients specified as target amounts are probably too low for realistic implementation in a lake with such a high ratio of lake surface to drainage area. Lake Elsinore has a ratio of 167 (3,000 to approximately 500,000 acres) and lakes with ratios over 1: 40 are generally eutrophic. Certainly, ratios in excess of 1:100 are almost certainly eutrophic. Note that the management of the lake that reduced that lake surface area by 50% also increased the likelihood of eutrophication.

The ratio of watershed to lake area can be combined with the depth of the lake (> 30 ft) to indicate morphometrical eutrophication. Lakes with water depth less than 30 ft are normally polymictic. That is, the water is mixed top-to-bottom every few days, or weeks, even in summer. The TMDL notes such a condition in Lake Elsinore and it is part of the model in Appendix 2. Given the large drainage basin, nutrients flow into the lake in large amounts. Also, with its shallow depth and polymixis, the nutrients grow algae in large amounts. Only by diverting the light or the nutrients into less nuisance forms, can the beneficial uses of Lake Elsinore be achieved. It is likely impossible to reduce the nutrients sufficiently in the watershed to achieve the beneficial uses set by the board. The beneficial uses are unnatural and can only be achieved by other means than classical TMDLs.

However, the existing beneficial uses can be achieved by other methods, primarily by lake management. Most importantly, good water clarity (> 2 m Secchi depth) is only achievable with biomanipulation that requires a relatively stable water level. The TMDL document will provide only ~ 0.5 to 1 m Secchi depth even if the TMDL targets are reached. A Secchi depth of 0.5 to 1 m should not be an acceptable value for public water contact recreation.

Recommendation 6. Fish kills not clearly related to water depth in partial contraction to the TMDL

We understand that staff believes this analysis does not warrant changing the TMDL recommendation but it emphasizes the value of a holistic approach to manage the Lake for increases in benefits instead of regulating without explicit cause and effect changes.

Fish kills are the second most important factor in the beneficial use impairment in Lake Elsinore after water level maintenance and prevention of the lake drying out. The TMDL correctly states that the fish kills are primarily due to low dissolved oxygen (DO) levels in the lake. However, the statement in the TMDL that "...it appears that fish kills coincide with either very shallow lake levels or high flows from the watershed due to heavy rainfall events" and the evidence provided in Table 3-1 does not fully reflect the most pertinent data and is open to alternative interpretations. One such alternative is presented below. In particular, it should be noted that although the draft EIR is correct in the above quote, it is only part of the story. It is also true that low lake levels that "caused" fish kills often did not result in large fish kills even in adjacent years. Other factors seem to play an important role and such factors include nocturnal convection. The distinction is important since different cures are needed for low water, nocturnal convection or other possible causes of the fish kills in the lake.

Data for the most recent years 1991-98 when the lake was in its current much reduced form but still with a full range of water depth is shown in Table 1. This table shows no good relationship between water levels and fish kills in Lake Elsinore. Data for earlier years (Appendix Table A-1) supports this finding in general. Fish kills occurred at high, low, and intermediate water levels. Large fish kills did occur at very low water levels in the 1986-92 drought but similar low lake levels, often in adjacent years, did not result in large fish kills. High lake levels resulting from recent high inflows were also not reliable predictors of fish deaths, in contradiction of the statements in the TMDL. Between 1982 and 2002, in water less than 17 ft, major fish kills occurred only 20% of the time. In water greater than this depth (18 - 33 ft) major fish kills occurred 14% of the time. If the very shallow waters of the 1987-92 droughts are excluded, fish kills of some kind occurred in 38% of years, all of these being in water over 17 ft deep. Thus, the evidence tends to suggest that shallow water is not a critical item in fish kills in the lake. Of course, if the water became very shallow, a few feet, the fish may run out of food or be crowded into such a small area that fish kills would occur. However, this has not been the case for the past few decades.

Table 1. Lake Elsinore: Surface elevation, water depth, dissolved oxygen and reported fish kills 1991-98.

Year	Max. depth (ft)	Fish kill estimate	Lake level
1991	8	Large	Very low
1992	7	Small	Very low
1993	33	Large	Very high
1995	32	Small	Very high
1996	27	Small	Desirable*
1997	23	Small	Desirable
1998	29	Medium	High

* Desirable is an agreed range of water depths.

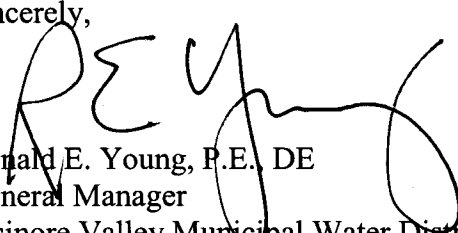
Overall, the lake levels in Lake Elsinore, California do not seem to have had a predictable effect on fish kills. Even at very low water levels ($< \sim 1233$ feet or maximum depth < 10 feet), large fish kills occurred only 2 out of the 4 recent years of record. Since the early years of the 1989-92 droughts did not produce large fish kills, the deaths cannot be due to the simple squeezing together of large numbers of fish as the lake diminished in volume. Therefore, another mechanism must operate along with the low water levels in order to result in large fish kills (see Table 2). In this table lake volume is used as an alternative to lake level and the amount of algae present (surrogate for simple oxygen depletion or excess eutrophication) is shown. It can be seen that fish kills were primarily due to some other factor than lake volume (lake level) or algae blooms (oxygen demand). There is not a clear relationship between algae blooms and fish kills. The lack of relationship is critical since the TMDL which attempts to control algae blooms via nutrient reductions. The evidence presented here is that such a control will be erratic and tentative and perhaps fish kills could more efficiently be reduced by other methods than TMDL implementation. And, there may be other reasons for the TMDL than fish kill reductions.

Table 2. Some statistics on oxygen conditions, oxygen demand and volume as related to fish kills for Lake Elsinore in the period 1990-96. Data from Montgomery-Watson (1997).

Date	Initial DO mg/L	Final DO mg/L	Duration of low DO days	Oxygen demand mg/L/d	Approx. lake volume (10 ⁶ m ³)	Mass based oxygen demand tons/day	Fish kill
July-Aug 90	6	0	60	0.10	35	3.4	X
March 91	7	0	30	0.23	35	8.1	
July-Aug 91	9	0	100	0.09	35	3.2	
Feb 1992	14	9	30	0.17	100	17	
March 92	9	6	30	0.10	100	10	
July-Aug 92	6.5	2	60	0.08	100	8	X
Mar-April 92	16	8	45	0.18	100	18	
Jun-Aug 94	8.5	2.5	90	0.07	100	17	
May 95	14.5	6	30	0.28	110	31	
June-July 95	9	3	90	0.07	110	7.3	X
June 96	10	5.5	30	0.15	92	14	

Thank you for the opportunity to review your proposed TMDL.

Sincerely,


Ronald E. Young, P.E., DE
General Manager
Elsinore Valley Municipal Water District

REY/ja

Enclosure

cc: Art Littleworth, Best, Best & Krieger

APPENDIX A. LAKE ELSINORE: FISH KILLS AND WATER DEPTH

Table A-1. Lake Elsinore: Surface elevation, water depth, dissolved oxygen and reported fish kills for 1982-2000. Equal attention to fish kills was probably not given to all years, especially higher water years 1982-87. However, the medium and large kills noted in the period 1991-98 would probably have reported. Data from Montgomery-Watson, 1997, Santa Ana Regional Water Quality Control Board, 2000, Riverside County Flood Control & Water Conservation District, 2001

Year	August Lake elevation ft	Max depth ft	Max depth m	DO < 1 mg/L at bottom	Fish kill M-W	Fish Kill RWQCB	Gen lake level	Mean depth, ft
1982	1251	28				No report	High	
1983	1260	37				No report	Very high	
1984	1252	29				No report	High	
1985	1248	25				No report	Desirable	
1986	1245	22				No report	Desirable	
1987	1241	18				No report	Desirable	
1988	1237	14				No report	Low	
1989	1233	10				No report	Low	
1990	1231	8		July-Aug	July-Aug	No report	Very low	
1991	1231	8		Mar-Apr, Oct	No	Large	Very low	
1992	1230	7		Aug	July-Aug	Small	Very low	
1993	1256	33		Aug?*	No	Large	Very high	
1994	1252	29		Sept	No	No report	High	
1995	1255	32		Aug	June-July	Small	Very high	25
1996	1250	27				Small	Desirable	
1997	1246	23				Small	Desirable	
1998	1252	29				Medium	High	
1999	1247	24				No report	Desirable	
2000	1243	20				No report	Desirable	
2001	1239	17				-	Desirable	

* No data reported for mid-summer, but DO 2 mg/L in July as in previous years when DO < 1 mg/L in August.

October 13, 2004

Mr. Gerard J. Thibeault
Executive Officer
California Regional Water Quality
Control Board - Santa Ana Region
3737 Main Street, Suite 500
Riverside, CA 92501-3339

Dear Mr. Thibeault:

Re: Comments on Draft Lake Elsinore and
Canyon Lake Nutrient TMDL and
Basin Plan Amendment

The Riverside County Flood Control and Water Conservation District (District) is the Principal Permittee on the Riverside County municipal separate storm sewer system (MS4) permit. The District is submitting the following comments on the Draft Lake Elsinore and Canyon Lake Nutrient TMDLs and Basin Plan Amendment (BPA) released September 3, 2004.

Adaptive Management

During the June workshop, several issues were raised by the District and other stakeholders regarding the feasibility of the TMDL. As you noted at the close of that workshop, the Regional Board is effectively being required to implement legal requirements without practical solutions. In recognition of this, however, Regional Board staff has made efforts to provide flexibility to the TMDL by incorporating adaptive management concepts. The adaptive management concepts are premised on allowing the science upon which the TMDL is based to continue to develop, then allowing for review and modification of the TMDL based on the improved science at specified future dates.

Adaptive management requires the ongoing participation and coordination of all stakeholders, including Regional Board staff. It also requires that the TMDL incorporate language identifying likely and potential deficiencies with the TMDL so that:

- Future Regional Board members reviewing revisions of the TMDL clearly understand that the existing TMDL was adopted with reservation;
- Stakeholders can justify expenditures of funds to support development of the science in those areas where the TMDL is understood to be deficient;
- Regional Board staff can continue to justify expenditure of staff time and resources to support the stakeholders efforts to revise and improve the TMDL, including justification of expenditures for future Basin Plan amendments; and

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- The stakeholders are allowed to apply for grants to further develop the science and technology necessary to address TMDL deficiencies, including lack of technology to address the problem.

Without this clear and transparent understanding of the known and potential deficiencies, it is likely that the adaptive management concepts will fail as those most familiar with the TMDL problems move on and current informal agreements and understanding are lost or forgotten. Recent reviews of Basin Plans for other Regional Board regions, including the Los Angeles Region, clearly indicate this potential for failure. These reviews of the administrative record for the aforementioned Basin Plans identify Basin Plan Amendments where Regional Board staff adopted inappropriate or tentative Water Quality Objectives for various waterbodies. The Water Quality Objectives were adopted to meet deadlines with the intention of reviewing them at a future date when more resources and time were available. In many cases, those staff members involved with the Basin Plan moved on and the intentions were forgotten, leading to presumptions by subsequent Board Members and staff that these Water Quality Objectives were appropriate and properly vetted prior to adoption. To avoid the mistakes made in other regions, it is important that the TMDL Basin Plan Amendment and Technical Support document clearly and transparently identify deficiencies.

To date, Board staff has made outstanding efforts to work with stakeholders to develop the TMDL, to incorporate adaptive management concepts, and to address stakeholder concerns. It is for this reason, that despite the District's position that the TMDL is both economically and technologically unachievable, we are willing to look past these deficiencies and participate in a cooperative effort with other responsible parties. However, the District believes that the following concepts and data need to be incorporated into the TMDL to ensure that known and potential deficiencies are clearly understood by present and future stakeholders.

Scientific Limitations

The District requests that the following discussion be appended to the end of the Introduction of the Technical Report:

In summary, the science supporting the interim and final TMDL numeric targets for total phosphorous and final TMDL numeric target for total nitrogen (numeric targets) proposed in the BPA is preliminary. Where science was lacking, Staff selected numeric target values conservatively for nutrients. The ability of the TMDL to achieve these standards has been called into question by the Regional Board's own peer reviewer, Dr. Josselyn:

"The proposed targets rely heavily on controls for internal nutrient cycling for Lake Elsinore which may not be achievable for practical and methodological reasons. The [Regional Board] staff needs to demonstrate that such technologies as suggested could actually work in this system."

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Although Dr. Josselyn indicated an alternative approach would be to require additional nutrient reductions in the upper watershed, several stakeholders, including the Riverside County Flood Control and Water Conservation District, have provided evidence that currently available technologies are not capable of addressing the proposed interim and final numeric targets for nutrients.

There is some concern that Lake Elsinore cannot naturally support the beneficial uses assigned to it. As stated by Dr. Josselyn:

"I concur with the statements that the Lake is naturally eutrophic given the observations of fish kills previously and the terminal nature of the Lake in this watershed...The targets for phosphorus as proposed reflect both the 'natural' eutrophic nature of Lake Elsinore, the reality of the high levels of phosphorus regeneration from the sediments, and the practicalities of trying to 'treat' sediments in-situ. The shallow nature of the lake leads to wind resuspension [a major source of phosphorus regeneration] that cannot be controlled."

It is clear that further analysis and review of the TMDL is necessary. If the additional science and analysis does not indicate that more assimilative capacity is available in the lakes, then a review of the Basin Plan Beneficial Uses may be in order to determine whether the existing designated beneficial uses for the lakes can be supported by natural conditions. The State Water Resources Control Board has issued draft guidance that indicates that standards should be revised based on attainability:

"If the failure to attain standards is due to the fact that the applicable standards are not appropriate to natural conditions, an appropriate regulatory response is to correct the standards" (December 2003 State Board Draft Water Quality Control Policy for Addressing Impaired Waters)

It is Staff's expectation that the phased analysis proposed by this TMDL will lead to the identification of additional assimilative capacity in the lakes and upper watershed.

Legality

The legal basis for the TMDL requirements is not clear. Although the District does not contend the right of the Regional Board to adopt a TMDL to regulate discharges to impaired receiving waters, the regulatory authority to require "retroactive clean up" of the sediments or nutrients in the lakes does not appear to exist in either the Clean Water Act or Porter-Cologne. The District requests that the authority to regulate the removal of sediments from the lakes by the upstream stakeholders be cited in the TMDL basin plan amendment. Without this authority, the Regional Board must assign Tasks 8 and 9 to place responsibility solely on the entities who own the lakes.

Staff's contention that the proposed numeric targets are only interpretations of existing water quality standards and not Water Quality Objectives does not comport with California Water

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Code. Upon adoption, the numeric targets would carry the weight of water quality objectives. The District supports EMWD's June 3 verbal comments regarding this issue.

The recent Superior Court ruling in City of Arcadia *et al* versus The SWRCB and Los Angeles Region RWQCB (December 24, 2003), states that any amendment of a Basin Plan, independent of whether it adopts water quality objectives is subject to Section 13241 of the California Water Code. Despite the appeal of this decision, the District holds that the Superior Court ruling was consistent with the intent of the law.

Are Permittees required to meet the same concentrations as specified in the Lakes?

Current nutrient BMP technologies, particularly those referenced in the September 17th Regional Board staff report are not capable of economically or technologically addressing the volume of water generated during a wet year. These BMPs are generally sized to treat flows from the average annual storm event and would short-circuit during wet year events. However, wet years are the only years that the upper watershed stakeholders contribute significant nutrient loads to Canyon Lake and Lake Elsinore. If the wet years cannot be treated, compliance with the interim phosphorus target for the TMDL is mathematically impossible for discharges to Canyon Lake. The following table clarifies this:

Allowable and Existing TP Discharges for Upper Watershed Stakeholders (Urban, CAFO, Agriculture, Open/Forest, Septic) to Canyon Lake

1. Allowable Annual TP Load for Upper Watershed	3,844 kg/yr
2. Cumulative 10 yr. Allowable TP Load	38,444 kg
3. Estimated Existing TP Load for Wet Year	43,031 kg/yr
4. Estimated Cumulative Existing TP Load for 1.6 Wet Years	68,849 kg
5. Mandatory Minimum TP Load Reduction for Wet Year (Row 4 – Row 2)	30,405 kg
6. Mandatory Minimum TP Load Reduction to Allow 1674 kg/yr [existing dry year TP discharge) TP discharge during 8 non-wet years (Row 4 – (1674*8)]	43,797 kg
7. Allowable Wet Year TP Load based on Row 6 (Row 4 – Row 6)/1.6 wet years	15,657 kg/yr
8. Estimated volume of flow during a typical wet year	139,345 ac ft
9. Mandatory Minimum Concentration for Influent to Canyon Lake From Upper Watershed	0.09 mg/l
10. Interim Target for TP Concentrations at Canyon Lake	0.10 mg/l

It is clear from the table that a single untreated wet year would exceed the entire 10-year allowable TP load for the upper watershed stakeholders. As stated before, this event is economically and technologically impossible to treat. Further, this statistic is particularly disconcerting considering that 1.6 wet years, or enough TP to generate nearly twice the allowable TP load to Canyon Lake are expected in a given 10-year compliance period. In order to allow a TP load of 1674 kg/yr into Canyon Lake during non-wet years, the wet year events MUST be reduced by approximately 63% to an allowable TP load of 15,657 kg into Canyon Lake. Based

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on a the wet year storm volume of 139,345 ac ft, a concentration of 0.09 mg/l, or slightly less than the interim 0.1 mg/l concentration required in-lake must be achieved. Again, as stated in our June 3rd letter, this is neither technologically nor economically feasible for dry or moderate years, much less during the extreme storm volume of a wet year.

In addition, as stated in our June 3rd letter and as supported by Dr. Josselyn's peer review of the TMDL, the ability of the available in-lake treatment technologies to meet the 30% and 70% load reductions is suspect at best. As noted by Dr. Josselyn, "the reduction levels for phosphorus sought for Lake Elsinore rely significantly on proposals that have not been tested for their effectiveness in this particular situation". Although Dr. Josselyn notes that alum may be an alternative treatment mechanism, current chemical conditions in Lake Elsinore are not ideal for alum addition; flocculation and sedimentation processes require lower pH levels in order to achieve successful phosphate removal.

Cost Estimates

Based on the EPA's Urban Nutrient Reduction BMP Costs (1999) referenced in the Regional Board Staff Report, the following table estimates the costs associated in the construction of nutrient reduction BMPs in the San Jacinto River Watershed to address the wet year flow volume (139,345 ac ft or approximately 6 billion cubic feet). The cost estimates below presume each stakeholder in the watershed tributary to Canyon Lake would implement the specified BMP. Urban Stakeholder BMP costs, based on a rough estimation of land use (both urban areas and non-urban areas tributary to urban systems) and runoff rates, could represent between 50-60% of the total cost identified below:

BMP Construction Costs to Treat Wet Year Flow

BMP	EPA, 2003 \$s (per ft³ treated)	Cost, 2003 \$s (V_{wet} = 6 Billion ft³)
Constructed Wetland	\$0.60 - \$1.13	\$ 3.6 B – \$ 6.78 B
Infiltration Trench	\$4.00	\$ 24 B
Infiltration Basin	\$1.18	\$ 7.08 B
Sand Filter	\$2.72 - \$5.96	\$ 16.3 B – \$ 35.7 B
Bioretention	\$4.79	\$ 28.7 B
Retention & Detention Basin	\$0.45 - \$0.90	\$ 2.7 B – \$ 5.4 B
Grass Swale	\$0.45	\$ 2.7 B
Filter Strip	\$0.00 - \$1.18	\$0 – \$ 7.1 B

In addition, costs are provided for BMPs to treat moderate year events:

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BMP Construction Costs to Treat Moderate Year Flow

BMP	EPA, 2003 \$s (per ft ³ treated)	Cost, 2003 \$s (V _{mod} = 253 M ft ³)
Constructed Wetland	\$0.60 - \$1.13	\$ 152 M – \$ 286 M
Infiltration Trench	\$4.00	\$ 1,000 M
Infiltration Basin	\$1.18	\$ 299 M
Sand Filter	\$2.72 - \$5.96	\$ 688 M – \$ 1,500 M
Bioretention	\$4.79	\$ 1,200 M
Retention & Detention Basin	\$0.45 - \$0.90	\$ 114 M – \$ 228 M
Grass Swale	\$0.45	\$ 114 M
Filter Strip	\$0.00 - \$1.18	\$0 – \$ 299 M

The above table does not include land acquisition, design, geotechnical testing, legal fees, and other unexpected or additional costs such as maintenance and operation of each BMP. It should be noted that in the arid climate of the San Jacinto River Watershed, BMPs such as constructed wetlands, grass swales and filter strips would require a reliable year-round supply of water, aside from storm and urban runoff, in order to operate. It is clear from the above referenced tables that it is neither economically nor technologically feasible to treat either the wet and/or moderate year flows. In addition, none of the BMPs referenced above are guaranteed to meet the 0.09 mg/l phosphorus concentration required of wet year discharges to comply with TMDL interim targets. The District would also note that the costs for wetlands identified above are commensurate with our June 3rd cost estimates for wetlands.

Newport Bay TMDL

Several references have been made at the stakeholder and Regional Board workshops regarding the success of the Newport Bay Nutrients TMDL. Although Orange County (OC) has had great success with achieving nutrient TMDL targets in Newport Bay, the OC-Permittees have noted that the nitrogen concentrations in their upper watershed can exceed 10 mg/l TN and have been able to reduce nitrogen concentrations to 2 mg/l. The OC-Permittees estimate expenditures of approximately \$5 million per year in capital and operational costs in order to achieve the nutrient targets. Stormwater discharges in the San Jacinto Watershed average 2-5 mg/l TN and stakeholders in this watershed will be required to reduce nitrogen concentrations to 0.75 mg/l. The TMDL programs are not numerically comparable – the proposed runoff concentrations to be achieved in the San Jacinto Watershed are significantly lower and economically unachievable under the best available BMP technologies. Further, treatment efficiency for available nutrient treatment BMPs diminishes as the effluent concentration is reduced and as the influent concentration approaches the required effluent concentration. The costs neither balance nor justify the anticipated benefits.

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Additional Proposed Recommendations

The District believes that the following recommendations would reasonably address the current deficiencies in the TMDLs:

1. Set narrative targets for nutrients since the TMDL is predicated on numeric targets that are intended to be more flexible than Water Quality Objectives. Another alternative is to consider the adoption of narrative targets for TP and TN. The narrative nutrient targets could require that discharges from the upper watershed not lead to exceedances of numeric dissolved oxygen concentration targets established for the Lakes; this would provide the stakeholders with additional flexibility to address the algal problems in the Lakes and would ensure that they are not penalized for non-compliance with an arbitrary numeric target;
2. The Regional Board should facilitate the stakeholder organizational effort by clearly identifying all responsible parties, including agricultural entities in either the Technical Report or the Basin Plan.
3. The Regional Board should also clearly identify in the Basin Plan the regulatory tools, such as NOV's, written requests or other actions that can be utilized to assist the stakeholders in gaining the support of the various responsible parties. The list should also identify how these tools may be used to ensure cooperation in and compliance with this proposed TMDL. For instance, how will regulatory tools be applied to assure all responsible parties financially support the joint monitoring requirements and the formulation and implementation of the Lake Sediment Nutrient Treatment requirements?
4. The Regional Board provide a launching point for TMDL implementation by recommending a fair and rational basis for allocating financial responsibility among all parties.
5. The compliance schedule for joint tasks should be extended by at least one year to accommodate the formation of a stakeholder organization, allow time for stakeholders to secure funding, and provide time for necessary consultants to be selected and contracted with.
6. If further analysis indicates that the lakes are naturally eutrophic, and thus the applicable standards are not appropriate to the natural conditions, the Regional Board should support a Use Attainability Analysis, or other appropriate mechanism, per the Water Quality Control Policy for Addressing Impaired Waters, to revise designated Beneficial Uses for the lakes.

Mr. Gerald J. Thibeault
Santa Ana Regional Water
Quality Control Board

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Summary

It is critical that the adaptive management process succeeds, especially upon careful consideration of the cumulative cost of the current and future TMDLs affecting stakeholders in the San Jacinto Watershed. Failure of the adaptive management program for this TMDL may require watershed stakeholders to unnecessarily expend billions of dollars toward a solution-less problem. Funds unnecessarily spent on this TMDL will also subtract from the stakeholders' abilities to respond to future TMDLs that could provide measurable benefits to receiving waters. The District believes that the aforementioned recommended changes are necessary to ensure that this adaptive management process succeeds.

If you have any questions, please contact Stephen Stump at 951.955.8411 of our Regulatory Division.

Very truly yours,

WARREN D. WILLIAMS
General Manager-Chief Engineer

JEU:ABC:cw
PC/90371

To: Hope Smythe, Chief of Inland Waters Planning Section
California Regional Water Quality Control Board, Santa Ana Region

From Robert Gearheart, Ph.D., P.E., Professor of Environmental Engineering
Humboldt State University, Arcata, California

Date: October 10, 2004

Subject: Review of Draft TMDL for Nutrients in Lake Elsinore and Canyon Lake

The purpose of the letter report is to provide the Regional Board a peer reviewed assessment of the draft TMDL for nutrients in Lake Elsinore and Canyon Lake in Riverside County California. Activities included in the review are: 1) review of TMDL requirements and procedures, 2) review of documents provided by Dr. Cindy Li, and 3) preparation of a report. I must apologize for the delay in the preparation of the report but my summer was filled with field research activities and volunteer work in El Salvador with Engineers without Borders.

Lake Elsinore and Canyon Lake Nutrient Sources Assessment, Tetra Tech

I. Introduction and Objective

There is no demographic descriptions of the watershed and associated water use, present-future.

Was it an objective of this report to allow for WLA to be developed for future land use activities? I don't believe I found any prediction, other than general comments about future land use designation. No mention of the fact that sections of this water shed is one of the fastest urbanized county in the state, for example, with some 10 and 20 years prediction of potential WLA from these changing land uses.

I. Watershed Background

I am not totally familiar with the area in terms of point source loads from WWTP are there significant loads and /or flows? It would seem that reclaimed wastewater (if treated to a high level) would be the most reliable source of water for use in lake restoration.

Confusing to me the role of Mystic Lake and Perris reservoir play in the TMDL process. Neither mentions in this section but referred to in section IV.

It may assist readers not familiar with the system (this reviewer for example) to have a flow diagram of the hydrological connection of the streams, lakes, drainages, etc.

I. Nutrient Source Overview

What is the basis for identifying failing septic tanks, unimpeded access of cattle to stream and unsolicited discharges as not being factors to consider in this report (or did I misinterpret this statement).

Groundwater sources, cattle contaminated groundwater, and resultant surface water interaction?

Fertilizer addition-no mention of groundwater contamination -interaction-surface water? Is there a potential significant load with urban horticultural N and P addition?

Were any attempts made to quantify ammonia volatilization from dairies, an atmospheric source?

Septic tank phosphorus emission calculations-no attenuation of P through the soil column?

IV Technical Approach

How is the water used that has been excessively pumped from groundwater?
What are the nutrient levels in the groundwater?

Hydrology-wastewater reclamation-groundwater recharge?

Water balance for the system-specifically the role of ET on Lake Volume-

Pollutant representation-Is it not possible or not useful in the eyes of the modelers to have TSS a primary pollutant to consider in the model. It is mentioned, sediment, in the following sentence as a pollutant to consider for future efforts.
It seems that the fate of phosphorus specifically could be tracked with sediment.

The nature of the soils (ACS Soil C and D) in and around the reservoirs, would suggest relatively high P adsorption values.

Internal loads from reservoir are these sinks a significant factor in modeling
In-lake chlorophyll production levels.

Model calibration and verification

Graphic analysis of calibration analysis, Fig. 4-22 through 4-25

The model effort appears to do better for the less extreme flows-what is lost by not have the same confidence for the high flow conditions?

Consistent under prediction of TN and TP not fully explained or accounted for in a sensitivity analysis.

5.0 Model Results

Figures 5-7 through 5-10 discussion- have antecedent conditions been considered in the three water year and relative land use assumptions. Limited discussion about these predictions. I would assume this is what the TMDL is all about in terms of source loading. Reoccurrence intervals for these types of water years could be used to develop a loading probability distribution relationship. Not sure what was modified from this report, if any in the draft TMDL amendment.

Internal Loading and Nutrient Cycling in Canyon Lake/lake Elsinore-Anderson, et. al.

Both of these documents focused on the lake/s nutrient dynamics with the purpose of the determining the effect of WLA's to the total nutrient budget of the system. I did not have sufficient time to review in any detail the assumptions made in the analysis. It does appear, though, that good science was practiced in terms of sampling protocols (spatial representation and replication), statistical implication, and key nutrient fate and transport processes.

I followed the approach taken by Anderson, ET. Al. and support the conclusions drawn from the analysis. Again I did not have time to determine exactly what portion of his findings were modified in the draft TMD. The potential negative impact (P release from sediments) from the destratification of the shallow region of Canyon Lake is highly plausible and should be carefully evaluated.

The effect of Ca precipitation on P removal is suggested but not supported by water quality data showing dissolved Ca, Mg, and Fe concentrations. Conclusions reached by Anderson's model in terms of P loading is significant in terms of the reality of reversing the eutrophic process.

The observed reduction of P levels in the lake over the period of the data set is an interesting observation and not fully explained in the report.

Proposed Basin Plan Amendment

The discussion on page 32, and the associated Figure 5-2, suggest that P is not buried in the sediment (as in a long term removal process). Discussion concerning phosphorus in the core samples seemed to deal more with the pore water not the fixed P. Perhaps there was information in the study but I did not find it. Given the type of sediment found in the lake I would guess that some P is driven to an ultimate sink. Even when all of the sediment is detrital material some of the P is buried, example Klamath Lake Oregon. I am not sure it would change the conclusion if it was a factor, but it appears to be missing in the conceptual modeling of the system.

While it appears to me, given the watershed condition, the climate, the land use activities, and the historic limnological conditions in the lake that there would a strong possibility that the requisite P and N loadings to reduce eutrophic conditions in the lake would not be possible. This is an example where the TMDL has no real application in terms of a likely outcome that removes the impaired water body status. Based upon the increasing pressure of development in eastern Riverside County and the internal load in the lakes the system it is probably non-reversible (Anderson 2002 and 2003).

The watershed loading and lake modeling efforts are well done and are representative of models that are commonly applied to conjunctive watershed/lake systems. The verification of the models suffer, as to many models, from lack of data. This is a particular problem with extreme water balance conditions, such as no out flows. I attempted to cross reference assumptions and finding between the Tetra Tech report, the Anderson reports and the draft TMDL amendment but was not able to complete due to time constraints.

I personally would have been interested in knowing more about the ecology of the lakes in terms of algal species, zooplankton species, fish species etc. There was mention of N fixation but little discussion of its temporal and/or spatial implication. Considering the fact that the nutrient balances were on an annual basis these factors might not be significant, but might be interesting in terms of seasonal fluctuations.

The study's support the conclusions that the eutrophic condition of the lakes will remain in an impaired status due to the internal load of P. The nitrogen limiting condition is not fully documented but strongly suggest based on the annual loadings analysis performs in the studies. The recommendation of setting a target of 0.1 mg/l of P is justified based upon the loading studies but not necessarily ecological supportable in terms of eutrophication processes. Phosphorus levels of 0.08 to 0.010 mg/l are commonly cited as the limiting level for eutrophication.

While there is no real discussion and or feasibility analysis of BPM's and restoration alternatives in these studies there are some options that should be considered. One option would be extract the internal load and external load by processing through wetlands. Since TDS apparently are not a real issue the P fixed in wetland plants could afford marginal habitat improvement if the water loss could be lived with. This concept would be find portion of the lakes to restore to habitat value and recreational uses.

The other types of things being looked at are the effect of certain humic compounds on the phyto-plankton populations. I am assuming blue-green algae are present since there is mention of N fixation. An example of an in-lake treatment for eutrophic bodies of water is based on the use of humic compounds released from the aqueous decomposition of various plant material. There is considerable literature and operational research activities dealing with barley straw humics in Scotland. There is some evidence that the humics (brown water) from tule wetland perform in a similar manner. Historic references, for example, by Native

Americans around Klamath Lake suggest that brown water conditions from leached humic materials reduce blue-green algal populations in the late summer months.

I think there should be some mention of the drought conditions that appear to more of a long term cycle or possible new status quo condition in the draft TMDL. Given the drought conditions and potential global warming factors some mention should be made on the impact of reclaimed wastewater in the system within the context of the draft TMDL. Perhaps some mention of how reclaimed wastewater can be used to modify the impaired water bodies. When suggesting an interim P level of 1.0 mg/l one is within the economic range of nutrient removal processes in the water reclamation systems.

From this reviewers' observation the methods and data sets used in these reports are representative of accepted scientific and engineering procedures and protocols. The report supports the conclusions and recommendations with the exception of the role of P fixation in the sediment via precipitation/adsorption processes. The only caveat is that there is no analysis of BM'P's to meet these loads in terms of effectiveness, reliability, level of participation, and spatial and temporal application. I would tend to be very pessimistic in terms of being able to reverse the impaired nature of these water bodies in both the interim (2015) and final (2020) time frame.